PESTICIDE SURFACE WATER QUALITY REPORT

AUGUST 1999 SAMPLING EVENT

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Pesticide Monitoring Project Report
August 1999 Sampling Event

Executive Summary

As part of the District's quarterly ambient monitoring program, unfiltered water samples were collected at 36 sites from August 4 to August 10, 1999 and analyzed for sixty-two pesticides and/or products of their degradation. The herbicides ametryn, atrazine, bromacil, diuron, hexazinone, metolachlor, norflurazon, simazine, and 2,4-D, along with the insecticide and fungicide ethion and metalaxyl, were detected in one or more of these surface water samples. The ethion concentration of 0.033 µg/L at S99 approached the 48-hour EC_{50} of 0.06 µg/L reported for *Daphnia magna*, a sensitive indicator species for aquatic macroinvertebrates. However, this concentration did exceed the chronic toxicity level (0.003 µg/L) for *Daphnia magna* calculated according to promulgated procedure (FAC 62-302.200). At this level, long term exposure can cause impacts to macroinvertebrate populations, but the pulsed nature of agricultural runoff releases to the canal system precludes drawing any conclusions about long term average exposures. The compounds and concentrations found are typical of those expected to be found in areas within intensive agricultural activity.

Background and Methods

The District's pesticide monitoring network includes 36 stations designated in the Everglades National Park Memorandum of Agreement, the Miccosukee Tribe Memorandum of Agreement, the Lake Okeechobee Operating Permit, and the non-Everglades Construction Project (non-ECP) permit. Surface waters are sampled quarterly and sediments semiannually.

Sixty-two pesticides and degradation products were analyzed for in samples from all of the 36 sites (Figure 1). The analytes, their respective minimum detection limits (MDL), and practical quantitation limits (PQL) are listed in Table 1. The reader is referred to the *Quality Assurance Evaluation* section of this report for a summary of any limitations on data validity that might influence the applicability or uses of this data set. Each pesticide's description and possible uses and sites of application are taken from Hartley and Kidd (1987). The Florida Ground Water Guidance Concentrations (FDEP, 1994) are listed to provide an indication at what level these pesticide residues could possibly impact human health, based on drinking water consumption or other routes of exposure (e.g., inhalation, ingestion of food residues, dermal uptake). Pesticides listed as having a primary ground water standard are enforceable ground water standards, not just a screening tool or guidance level. To evaluate the potential impacts on aquatic life, due to the pulsed nature of exposure, the maximum observed concentration is compared to the lowest EC_{50} or LC_{50} for indigenous species as reported in the literature. This summary covers surface water samples collected between August 4 and August 10, 1999.

Findings and Recommendations

At least one pesticide was detected in surface water at 31 of the 36 sites in the monitoring network; the concentrations of pesticides detected are summarized in Table 2. All these

compounds have previously been detected in this monitoring program. The concentration of ethion (0.033 µg/L) at S99, approached the 48-hour EC_{50} of 0.06 µg/L, reported for *Daphnia magna*, a sensitive indicator species for aquatic macroinvertebrates (Figure 2). At this level, long term exposure can cause impacts to macroinvertebrate populations. However, the pulsed nature of agricultural runoff releases to the canal system precludes drawing any conclusions about long-term average exposures. Since August 1995, nine out of 17 sampling events had a detectable level of ethion. With the method detection limit of 0.019 µg/L, any detection would automatically exceed the calculated chronic toxicity level (0.003 µg/L).

The above findings must be considered with the caveat that pesticide concentrations in surface water and sediment may vary significantly with relation to the timing and magnitude of pesticide application, rainfall events, pumping and other factors, and that this was only one sampling event. The possible long term or chronic toxicity impacts are also reported based on the single sampling event and do not take into account previous monitoring data.

Usage and Water Quality Impacts

Ametryn: Ametryn is a selective terrestrial herbicide registered for use on sugarcane, bananas, pineapple, citrus, corn, and non-crop areas. Most effects on algae occur at concentrations > 10 µg/L (Verschueren, 1983). Environmental fate and toxicity data in Tables 3 and 4 indicate that ametryn (1) is lost from soil relatively easily by leaching, surface adsorption, and in surface solution; (2) is relatively non-toxic to mammals and fish; and (3) does not bioconcentrate significantly. Additional fish toxicity data includes a 96-hour LC_{50} of 14.1 mg/L for goldfish (Hartley and Kidd, 1987). The ametryn surface water concentrations found in this sampling event ranged from 0.012 to 0.086 µg/L (Table 2). Using these criteria, these surface water levels should not have an acute, detrimental impact on fish or aquatic invertebrates.

Atrazine: Atrazine is a selective systemic herbicide registered for use on pineapple, sugarcane, corn, rangelands, ornamental turf and lawn grasses, and non-crop areas. Environmental fate and toxicity data in Tables 3 and 4 indicate that atrazine (1) is easily lost from soil by leaching and in surface solution, with moderate loss from surface adsorption; (2) is relatively non-toxic to mammals and fish; and (3) does not bioconcentrate significantly. Additional fish toxicity data include a 96-hour LC_{50} of 76 mg/L for carp, 16 mg/L for perch and 4.3 mg/L for guppies (Hartley and Kidd, 1987). Also, in a flow-through bioassay, the maximum acceptable toxicant concentration (MATC) of atrazine was 90 and 210 µg/L for bluegill and fathead minnow (Verschueren, 1983). Atrazine inhibits cell multiplication of the alga, *Microcystis aeruginosa*, at 3 µg/L and most other biological effects occur at higher concentrations (Verschueren, 1983). The atrazine surface water concentrations found in this sampling event ranged from 0.022 to 0.82 µg/L (Table 2). Using these criteria, these levels should not have an acute, detrimental impact on fish or aquatic invertebrates.

Bromacil: Bromacil is a terrestrial herbicide registered for use on pineapple, citrus, and non-crop areas. Environmental fate and toxicity data in Tables 3 and 4 indicate that

bromacil (1) is easily lost from soil by leaching, with moderate loss from surface adsorption or surface solution; (2) is relatively non-toxic to mammals and fish; and (3) does not bioconcentrate significantly. Additional fish toxicity data includes a 96-hour LC_{50} of 164 mg/L for carp (Hartley and Kidd, 1987). The highest concentration of bromacil detected in the surface water during this sampling event was 1.9 µg/L (Table 2). Using these criteria, these levels should not have an acute or chronic detrimental impact on fish.

Diuron: Diuron is a selective, systemic terrestrial herbicide registered for use on sugarcane, bananas, and citrus. Environmental fate and toxicity data in Tables 3 and 4 indicate that diuron (1) is easily lost from soil in surface solution, with moderate loss from leaching or surface adsorption; (2) is relatively non-toxic to mammals and fish; and (3) does not bioconcentrate significantly. Additional fish toxicity data includes a 96-hour LC_{50} of 25 mg/L for guppies (Hartley and Kidd, 1987). Crustaceans are affected at lower concentrations with a 48 hour LC_{50} of 1.4 mg/L for water fleas and a 96 hour LC_{50} of 0.7 mg/L for water shrimp (Verschueren, 1983). Most algal effects occur at concentrations > 10 µg/L (Verschueren, 1983). The highest concentration of diuron found during this sampling event was 0.72 µg/L (Table 2). Using these criteria, this level should not have an acute, harmful impact on fish or algae.

Ethion: Ethion is a non-systemic acaricide and insecticide registered for use on several fruits, citrus, and vegetables. Environmental fate and toxicity data in Tables 3 and 4 indicate that ethion (1) is strongly sorbed to soil and therefore can accumulate in sediments; (2) is slightly toxic to mammals, relatively toxic to fish and extremely toxic to Daphnia; and (3) bioconcentrates to a limited extent. Several sources of toxicity information have shown both agreement and disagreement of these laboratory tests. The ethion concentration of 0.033 µg/L at S99 approached the 48-hour EC_{50} of 0.06 µg/L, reported for *Daphnia magna*, a sensitive indicator species for aquatic macroinvertebrates (Table 2). At this level, long term exposure can cause impacts to the macroinvertebrate populations, but the pulsed nature of agricultural runoff releases to the canal system precludes drawing any conclusions about long term average exposures. Since August 1995, nine out of seventeen sampling events had a detectable level of ethion (Figure 2). With the method detection limit of 0.019 µg/L, any detection would automatically exceed the calculated chronic toxicity (0.003 µg/L).

Hexazinone: Hexazinone is a non-selective contact herbicide that inhibits photosynthesis. Registered uses include sugarcane, pineapple, and non-crop areas. Environmental fate and toxicity data in Tables 3 and 4 indicate that hexazinone (1) is easily lost from soil by leaching, with moderate loss from surface adsorption or surface solution; (2) is relatively non-toxic to mammals and fish; and (3) does not bioconcentrate significantly. Hexazinone is practically non-toxic to freshwater invertebrates with an EC_{50} of 145 mg/l for *Daphnia magna* (U.S. Environmental Protection Agency, 1988). The highest concentration of hexazinone detected in the surface water during this sampling event was 0.032 µg/L (Table 2). Using these criteria, these levels should not have an acute or chronic detrimental impact on fish or aquatic invertebrates.

Metalaxyl: Metalaxyl is a systemic fungicide. Registered uses include potatoes, strawberries, citrus, avocados and vegetables. Environmental fate and toxicity data in Tables 3 and 4 indicate that metalaxyl (1) is easily lost from soil by leaching and has a moderate potential for loss due to surface adsorption and surface solution; (2) is relatively non-toxic to mammals and fish; and (3) does not bioaccumulate significantly. The highest concentration of metalaxyl detected was 0.10 µg/L (Table 2). Using these criteria, the concentrations of metalaxyl detected should not have an acute, harmful impact on fish or aquatic invertebrates.

Metolachlor: Metolachlor is a selective herbicide used on potatoes, sugarcane, and some vegetables. Environmental fate and toxicity data in Tables 3 and 4 indicate that metolachlor (1) has a large potential for loss due to leaching and a medium potential for loss in surface solution and due to surface adsorption; (2) is relatively non-toxic to mammals and fish; and (3) does not bioconcentrate significantly. Metolachlor is non-toxic to birds (Lyman et al., 1990). The highest concentration of metolachlor detected was 0.50 µg/L at S5A (Table 2). This is more than two orders of magnitude below the calculated chronic action level. Using these criteria, these levels should not have a harmful impact on fish or aquatic invertebrates.

Norflurazon: Norflurazon is a selective herbicide registered for use on many crops including citrus. Environmental fate and toxicity data in Tables 3 and 4 indicate that norflurazon (1) is easily lost from soil surface solution and a moderate potential for loss due to leaching and surface adsorption; (2) is relatively non-toxic to mammals and fish; and (3) does not bioconcentrate significantly. The LC_{50} for norflurazon is >200 mg/L for catfish and goldfish (Hartley and Kidd, 1987). The norflurazon surface water concentrations ranged from 0.063 to 1.6 µg/L (Table 2). Even at the highest concentration, this is over two orders of magnitude below the calculated chronic action level. Using these criteria, these levels should not have an acute, detrimental impact on fish or aquatic invertebrates.

Simazine: Simazine is a selective systemic herbicide registered for use on many crops including sugarcane, citrus, corn, and non-crop areas. Environmental fate and toxicity data in Tables 3 and 4 indicate that simazine (1) is easily lost from soil by leaching and has a moderate potential for loss due to surface adsorption and surface solution; (2) is relatively non-toxic to mammals and fish; and (3) does not bioconcentrate significantly. Additional fish toxicity data include a 96-hour LC_{50} of 49 mg/L for guppies (Hartley and Kidd, 1987). Most of the aquatic biological effects occur at concentrations > 500 µg/L (Verschueren, 1983). Aquatic invertebrate LC_{50} toxicity ranges from 3.2 mg/L to 100 mg/L for simazine (U.S. Environmental Protection Agency, 1984). The highest surface water concentration of simazine found in this sampling event was 0.080 µg/L, far below any level of concern for fish or aquatic invertebrates (Table 2).

2,4-D: 2,4-D is a selective systemic herbicide used for the post-emergence control of annual and perennial broad leaf weeds in terrestrial (grassland, established turf, sugarcane, rice, and on non-crop areas) as well as aquatic areas. Environmental fate and toxicity data in Tables 3 and 4 indicate that 2,4-D (1) has minimum loss from soil by

surface adsorption, with a moderate loss by leaching and surface solution; (2) is slightly toxic to mammals and relatively non-toxic to fish; and (3) does not bioaccumulate significantly. The only 2,4-D concentration was detected at C51SR7 (4.2 µg/L) (Table 2). Using these criteria, these levels should not have an acute impact on fish or aquatic invertebrates.

Quality Assurance Evaluation

Four duplicate samples were collected at sites S331, S18C, S5A, and S65E. All the analytes detected in the surface water had precision ≤30% RPD. No analytes were detected in the field blanks collected at S18C and S5A. All samples were shipped and all bottles were received.

Low concentrations of representative analytes from each pesticide group/method were added to laboratory water as well as to samples submitted. The reported values for atrazine and ametryn were estimated for sites S6, S177, S178, and C51SR7, and S235, respectively, due to the calibration check standard exceeding control limits. Comparisons are based on the FDEP Comprehensive Quality Assurance Plan targets for precision and accuracy. Organic quality assurance targets are set according to historically generated data or are adapted from the U.S. Environmental Protection Agency with slight modifications or internal goals, based on FDEP limited data. Parameters with low or high recoveries indicate that the sample matrix interferes with these analyses and interpretation of the respective analytical results should consider this effect. The sample collection procedure used for this event employed a triple rinsing of the sample bottles, a procedure which has the potential for biasing the ambient concentration higher, relative to what would be representative of the surface water sample. The bias is based on the contention that the analytical laboratory performs a whole sample extraction and a solvent rinse of the bottle inner surface. This situation is currently being investigated.

Glossary

LD_{50}: The dosage that is lethal to 50% of the test species within a short (acute) exposure period, usually 24 to 96 hours.

LC_{50}: A concentration that is lethal to 50% of the test species within a short (acute) exposure period, usually 24 to 96 hours.

EC_{50}: A concentration necessary for 50% of the test species to exhibit a toxic effect short of mortality (e.g., swimming on side or upside down, cessation of swimming) within a short (acute) exposure period, usually 24 to 96 hours.

K_{oc}: The soil/sediment partition or sorption coefficient normalized to the fraction of organic carbon in the soil. This value provides an indication of the chemical's tendency to partition between soil organic carbon and water.

Bioconcentration Factor:
The ratio of the concentration of a contaminant in an aquatic organism to the concentration in water, after a specified period of exposure via water only. The

duration of exposure should be sufficient to achieve a near steady-state condition.

Soil or water half-life:
The time required for one-half the concentration of the compound to be lost from the water or soil under the conditions of the test.

MDL: The minimum concentration of an analyte that can be detected with 99% confidence of its presence in the sample matrix.

PQL: The lowest level of quantitation that can be reliably achieved within specified limit of precision and accuracy during routine laboratory operating conditions. The PQL is further verified by analyzing spike concentrations whose relative standard deviation in 20 fortified water samples is < 15%. In general, the PQL is 2 to 5 times larger than the MDL.

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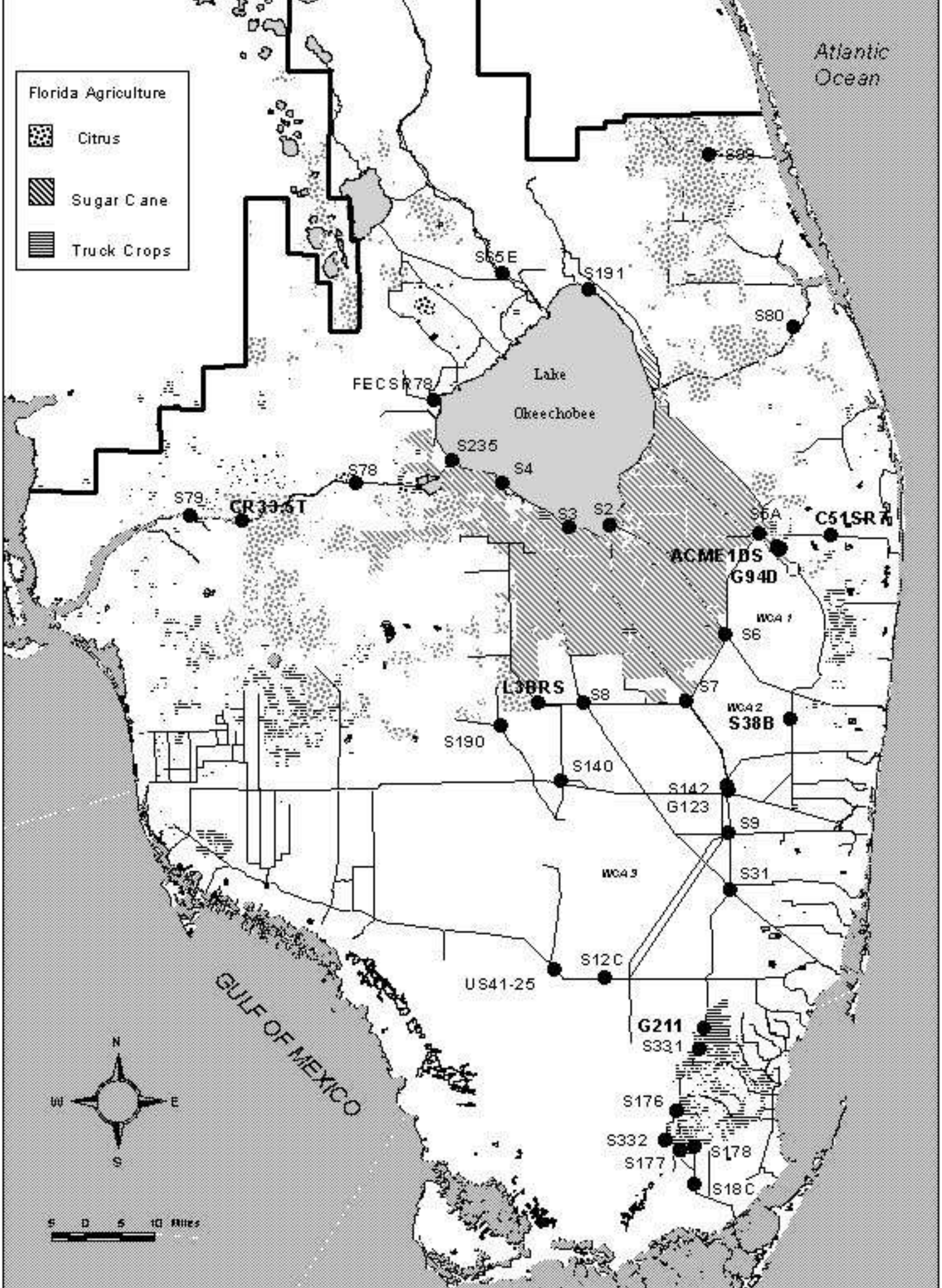
Florida Agriculture
Citrus
Sugar Cane
Truck Crops
Atlantic Ocean
S80
S191
S155E
FECSR78
Lake Okeechobee
S235
S4
S78
S79
CR336T
S3
S2
S6A
C51SR7
ACME1DS
G94D
WCA 1
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S8
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WCA 2
S38B
S190
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Table 1. Minimum detection limits (MDL) and practical quantitation limits (PQL) for pesticides determined in August 1999.

Pesticide	Water range of MDL-PQL (µg/L)	Pesticide	Water range of MDL-PQL (µg/L)
2,4-D	2 – 4	endosulfan sulfate	0.0019 - 0.011
2,4,5-T	2 – 4	endrin	0.0019 - 0.0097
2,4,5-TP (silvex)	2 – 4	endrin aldehyde	0.0019 - 0.0097
alachlor	0.047 - 0.27	ethion	0.019 - 0.097
aldrin	0.00094- 0.0054	ethoprop	0.019 - 0.097
ametryn	0.0094 - 0.054	fenamiphos (nemacur)	0.028 – 0.15
atrazine	0.0094 - 0.054	fonofos (dyfonate)	0.019 - 0.097
azinphos methyl (guthion)	0.019 – 0.097	heptachlor	0.00094- 0.0049
α-BHC (alpha)	0.00094 - 0.0054	heptachlor epoxide	0.00094 - 0.0097
β-BHC (beta)	0.0019 - 0.11	hexazinone	0.019 – 0.097
δ-BHC (delta)	0.00094- 0.0054	imidacloprid	0.4 – 0.8
γ-BHC (gamma) (lindane)	0.00094 - 0.0054	linuron	0.4 - 0.8
bromacil	0.038 – 0.22	malathion	0.028 - 0.15
butylate	0.019 - 0.097	metalaxyl	0.057 – 0.29
carbophenothion (trithion)	0.028- 0.033	methoxychlor	0.0038 –0.039
chlordane	0.0094 – 0.11	metolachlor	0.047 – 0.24
chlorothalonil	0.019 - 0.022	metribuzin	0.019 – 0.097
chlorpyrifos ethyl	0.019 - 0.097	mevinphos	0.038 – 0.19
chlorpyrifos methyl	0.019 - 0.097	mirex	0.0019 - 0.0097
cypermethrin	0.0047 - 0.054	naled	0.075 – 0.39
DDD-p,p’	0.0019 - 0.0097	norflurazon	0.028 – 0.15
DDE-p,p’	0.0019 - 0.011	parathion ethyl	0.019 – 0.097
DDT-p,p’	0.0019 - 0.011	parathion methyl	0.019 – 0.097
demeton	0.094 – 0.49	PCB	0.019 – 0.097
diazinon	0.019 - 0.097	permethrin	0.047 - 0.019
dicofol (kelthane)	0.019 - 0.043	phorate	0.028 - 0.15
dieldrin	0.0019 - 0.0054	prometryn	0.019 - 0.097
disulfoton	0.028 - 0.15	simazine	0.019 - 0.097
diuron	0.4 - 0.8	toxaphene	0.071 – 0.29
α-endosulfan (alpha)	0.0019 - 0.011	trifluralin	0.0094 - 0.0097
β-endosulfan (beta)	0.0019 - 0.011	zinc phosphide	0.5 – 2.0

Table 2. Summary of pesticide residues above the method detection limit found in water samples collected by SFWMD in August 1999

DATE	SITE	FLOW	COMPOUND (ug/L)											Number of compounds detected at site
			ametryn	atrazine	bromacil	diuron	ethion	hexazinone	metalaxyl	metolachlor	norflurazon	simazine	2,4-D	
8/04/99	S38B	no	-	0.38	-	-	-	-	-	-	-	-	-	1
	G123	no	0.012 I	0.022 I	-	-	-	-	-	-	-	-	-	2
	S142	yes	0.033 I	0.047 I	-	-	-	-	-	-	-	-	-	2
	S9	yes	-	-	-	-	-	0.020 I	-	-	-	-	-	1
	S31	no	0.018 I	0.051	-	-	-	-	-	-	-	-	-	2
	S12C	yes	-	0.035 I	-	-	-	-	-	-	-	-	-	1
	US41-25	yes	-	-	-	-	-	-	-	-	-	-	-	0
	G211	no	-	-	-	-	-	-	-	-	-	-	-	0
	S331	yes	-	0.031 I*	-	-	-	0.032 I*	-	-	-	-	-	2
	S176	no	-	0.048	-	-	-	0.022 I	-	-	-	-	-	2
	S332	yes	-	0.034 I	-	-	-	0.021 I	-	-	-	-	-	2
	S177	yes	-	-	-	-	-	0.024 I	-	-	-	-	-	1
	S178	no	-	-	-	-	-	-	-	-	-	-	-	0
	S18C	yes	-	0.053 *	-	-	-	-	-	-	-	-	-	1
8/05/99	S140	yes	-	-	-	-	-	0.027 I	-	-	0.063 I		-	2
	S190	yes	-	-	0.038 I	-	-	-	-	-	0.092 I		-	2
	L3BRS	yes	-	-	-	-	-	-	-	-	-	-	-	0
	S8	no	0.021 I	0.068	-	-	-	-	-	-	-	-	-	2
	C51SR7	yes	0.016 I	-	-	-	-	-	-	-	0.10 I		4.2 A	3
8/09/99	G94D	yes	0.031 I	-	-	0.72 I	-	-	-	-	-	-	-	2
	ACME1DS	yes	0.028 I	-	-	0.56 I	-	-	-	-	-	-	-	2
	S5A	no	0.070 *	0.82 *	-	-	-	0.019 I*	-	0.50 *	-	-		4
	S6	no	0.086	0.12	-	-	-	-	-	-	-	-	-	2
	S7	no	0.064	0.030 I	-	-	-	-	-	-	-	-	-	2
	S2	no	0.065	0.29	-	-	-	-	-	0.048 I	-	-		3
	S3	no	-	0.081	-	-	-	-	-	-	-	-	-	1
	S4	no	-	0.048 I	-	-	-	-	-	-	-	-	-	1
	S235	reverse	-	0.056	-	-	-	0.031 I	-	-	-	-	-	2
	S78	no	0.068	0.094	0.33	-	-	0.024 I	-	-	0.63	0.023 I	-	6
	CR33-5T	no	0.050	0.051	0.68	-	-	-	0.10 I	-	0.36	0.021 I	-	6
8/10/99	S79	no	0.045 I	0.046 I	0.23	-	-	-	0.064 I	-	0.31	0.028 I	-	6
	FECSR78	no	-	-	-	-	-	-	-	-	-	-	-	0
	S65E	yes	-	-	0.071 I*	-	-	-	-	-	-	-	-	1
	S191	no	-	-	0.16 I	-	-	-	-	-	-	-	-	1
	C25599	no	-	-	1.9	0.60 I	0.033 I		-	-	1.6	0.080 I	-	5
	S80	yes	-	-	0.28	-	-	-	-	-	0.45	0.042 I	-	3
Total number of compound detections			14	20	8	3	1	9	2	2	8	5	1	

- denotes that the result is below the MDL; * - results are the average of duplicate samples; I – value reported is less than the minimum quantitation limit, and greater than or equal to the minimum detection limit

Table 3. Selected properties of pesticides found in the August 1999 sampling event.

Common name	FDEP Surface Water Standards 62-302 (µg/L)	Florida Ground Water Guidance Conc. (µg/L)	LD_{50} acute rats oral (mg/Kg) (1)	EPA carcinogenic potential	Water Solubility (mg/L) (2, 3)	Koc (ml/g) (2, 3)	soil half-life (days) (2, 3)	SCS rating (2) LE	SA	SS	Bioconcentration Factor (BCF)
2,4,D	(100)	70**	375	D	890	20	10	M	S	S	13
ametryn	-	63	1,110	D	185	300	60	M	M	M	33
atrazine	-	3**	3,080	C	33	100	60	L	M	L	86
bromacil	-	90	5,200	C	700	32	60	L	M	M	15
diuron	-	14	3,400	D	42	480	90	M	M	L	75
ethion	-	3.5	208	-	1.1	8,900	150	S	L	M	586
hexazinone	-	231	1,690	D	33,000	54	90	L	M	M	2
metalaxyl	-	420	669	-	7,100	100	70	L	M	M	4
metolachlor	-	1,050	2,780	C	530	200	90	L	M	M	18
norflurazon	-	280	9,400	-	28	700	90	M	M	L	94
simazine	-	4**	>5,000	C	6.2	130	60	L	M	M	221

SCS Ratings are pesticide loss due to leaching (LE), surface adsorption (SA) or surface solution (SS) and grouped as large (L), medium (M), small (S) or extra small (XS)
Bioconcentration Factor (BCF) calculated as BCF = 10^(2.791 - 0.564 log WS) (4)
B2: probable human carcinogen; C: possible human carcinogen; D: not classified; E: evidence of non-carcinogen for humans (5)
FDEP surface water standards (12/96) for Class III water except Class I in ( )
**primary standard

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Table 4. Toxicity of pesticides found in the August 1999 sampling event to selected freshwater aquatic invertebrates and fishes (ug/L).

common name	48 hr EC_{50} Water flea *Daphnia magna*		acute Toxicity (*)	chronic toxicity (*)	96 hr LC_{50} Fathead Minnow (#) *Pimephales promelas*		acute toxicity	chronic toxicity	96 hr LC_{50} Bluegill *Lepomis macrochirus*		acute toxicity	chronic toxicity	96 hr LC_{50} Largemouth Bass *Micropterus salmoides*		acute toxicity	chronic toxicity	96 hr LC_{50} Rainbow Trout (#) *Oncorhynchus mykiss*		acute toxicity	chronic toxicity	96 hr LC_{50} Channel Catfish *Ictalurus punctatus*		acute toxicity	chronic Toxicity
2,4-D	25,000	(6)	8,333	1,250	133,000	(6)	44,333	6,650	180,000	(7)	60,000	9,000	-		-	-	100,000	(4)	33,333	5,000	-		-	-
ametryn	28,000	(6)	9,333	1,400	-		-	-	4,100	(4)	1,367	205	-		-	-	8,800	(4)	2,933	440	-		-	-
atrazine	6,900	(6)	2,300	345	15,000	(6)	5,000	750	16,000	(4)	5,333	800	-		-	-	8,800	(4)	2,933	440	7,600	(4)	2,533	380
bromacil	-		-	-	-		-	-	127,000	(6)	42,333	6,350	-		-	-	36,000	(6)	12,000	1,800	-		-	-
diuron	1,400	(6)	467	70	14,200	(6)	4,733	710	5,900	(4)	1,967	295	-		-	-	5,600	(4)	1,867	280	-		-	
ethion	0.06	(1)	0.02	0.003	720	(1)	240	36	210	(1)	70	11	173	(1)	58	9	500	(1)	167	25	7,600	(1)	2,533	380
	-		-	-	-		-	-	13	(2)	4.3	0.65	150	(3)	50	8	193	(2)	64	10	7,500	(3)	2,500	375
	-		-	-	-		-	-	22	(3)	7.3	1.1	-		-	-	560	(3)	187	28	-		-	-
hexazinone	151,600	(6)	50,533	7,580	274,000	(4)	91,333	13,700	100,000	(6)	33,333	5,000	-		-	-	180,000	(6)	60,000	9,000	-		-	-
metalaxyl	28,000	(6)	9,333	1,400	-		-	-	139,000	(6)	46,333	6,960	-		-	-	132,000	(6)	44.000	6.600	-		-	-
metolachlor	23,500	(6)	7,833	1,175	-		-	-	15,000	(4)	5,000	750	-		-	-	2,000	(4)	667	100	4,900	(5)	1633	245
norflurazon	15,000	(6)	5,000	750	-		-	-	16,300	(6)	5,433	815	-		-	-	8,100	(6)	2,700	405	>200,000	(4)	>67,000	>10,000
simazine	1,100	(6)	367	55	100,000	(6)	33,333	5,000	90,000	(4)	30,000	4,500	-		-	-	100,000	(6)	33,333	5,000	-		-	-

(*) Florida Administrative Code (FAC) 62-302.200, for compounds not specifically listed, acute and chronic toxicity standards are calculated as one-third and one-twentieth, respectively, of the amount lethal to 50% of the test organisms in 96 hours, where the 96 hour LC_{50} is the lowest value which has been determined for a species significant to the indigenous aquatic community.

(#) Species is not indigenous. Information is given for comparison purposes only.

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Figure 2. Ethion Concentration in Surface Water at S99